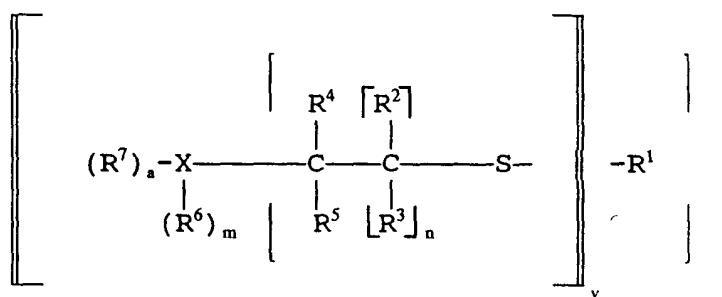


The subject matter claimed is:

1. A polymeric composition comprising a polymer normally susceptible to heat-induced deterioration through autoxidation and degradation products of a blocked mercaptan present during processing of the composition at an elevated temperature, said products including a free mercaptan, wherein said blocked mercaptan has the structure:



wherein a is 0 or 1, m and n are 0 or 1; y = 1 to 4; when y = 1, z is 1 to 4; and when y is more than 1, z is 1; R¹ is a hydroxyalkyl, dihydroxyalkyl, hydroxy(polyalkoxy)alkyl, alkoxyalkyl, hydroxyalkoxyalkyl, alkoxy(hydroxyalkyl), alkoxy(acyloxyalkyl), alkoxy(polyalkoxy)alkyl, carboxyalkyl, acyloxyalkyl, acyloxy(hydroxyalkyl), acyloxyalkoxyalkyl, acyloxy(polyalkoxy)alkyl, benzoyloxy(polyalkoxy)alkyl, alkylenebis-(acyloxyalkyl), alkoxycarbonylalkyl, alkoxycarbonylalkylenyl, hydroxyalkoxycarbonylalkyl, hydroxy(polyalkoxy)carbonylalkyl, alkoxy(polyalkoxy)carbonylalkyl, mercaptoalkyl, mercaptoalkylenyl, mercaptoalkoxycarbonylalkyl, mercaptoalkoxycarbonylalkylenyl, alkoxycarbonyl(amido)alkyl, alkylcarbonyloxy(polyalkoxy)carbonylalkyl, tetrahydropyranyloxyalkyl, tetrahydropyranyloxy(polyalkoxy)carbonylalkyl, hydroxyaryl, mercaptoaryl or carboxyaryl radical having from 1 to 22 carbon atoms; R², R³, R⁴, R⁵, R⁶, and R⁷ are independently hydrogen, a hydroxyl, mercapto, acyl, alkyl, alkylene, aryl, haloaryl, alkaryl, aralkyl, hydroxyalkyl, mercaptoalkyl, hydroxyaryl, alkoxyaryl, alkoxyhydroxyaryl, hydroxyalkyl, mercaptoalkyl, mercaptoalkylenyl, mercaptoalkoxycarbonylalkylenyl, hydroxyaryl,

arylcarbonyl, mercaptoaryl, carboxyalkyl, carboxyaryl, or acyl radical having from 1 to 22 carbon atoms; X is aryl, haloaryl, alkaryl, hydroxyaryl, dihydroxyaryl, aralkaryl, alkoxyaryl, arylcycloalkyl, or a heteroatom, with the option that when a is 1 and m is 0, one of the R³ and R⁵ radicals joins with R⁷ and X to form a heterocyclic moiety with X as a heteroatom selected from the group consisting of oxygen and sulfur, and with the further option that when m is 1, R⁶ and R⁷ form a heterocyclic moiety in conjunction with X as a nitrogen atom; with the proviso that when X is aralkaryl, R⁶ and R⁷ are hydroxyl, a is 1 and m is 1, then z is 1 or 2, and with the further proviso that when R⁶ ≠ hydroxyl or mercapto, z is 1.

2. The composition of claim 1 wherein X is nitrogen, m is 1, R⁶ and R⁷ form a heterocyclic moiety in conjunction with X, and n is 0.

3. The composition of claim 1 wherein R¹ is hydroxyalkyl.

4. The composition of claim 1 wherein X is nitrogen, m is 1, R⁶ is acyl, R⁴ is alkyl, R¹ is hydroxyalkyl, and n is 0.

5. The composition of claim 1 wherein X is oxygen, m is 0, R⁵ and R⁷ form a heterocyclic moiety in conjunction with X, and n is 0.

6. The composition of claim 5 wherein R¹ is hydroxyalkyl.

7. The composition of claim 1 wherein R¹ is acyloxyalkyl,

8. The composition of claim 1 wherein X is oxygen, m is 0, R⁵ and R⁷ form a heterocyclic moiety in conjunction with X, and n is 1.

9. The composition of claim 8 wherein R¹ is hydroxyalkyl.

10. The composition of claim 8 wherein R¹ is acyloxyalkyl.

11. The composition of claim 1 wherein X is phenyl, and m and n

are 0.

12. The composition of claim 11 wherein R^1 is hydroxyalkyl.

5 13. The composition of claim 1 wherein X is phenyl, R^7 is hydroxyl, and m and n are 0.

14. The composition of claim 13 wherein R^1 is hydroxyalkyl.

10 15. The composition of claim 14 wherein R^1 is hydroxyethyl.

16. The composition of claim 13 wherein R^1 is acyloxyalkyl.

15 17. The composition of claim 1 wherein X is phenyl, R^7 is hydroxyl, m is 0, and n is 1.

18. The composition of claim 1 wherein X is oxygen, R^7 is phenyl, m is 0, and n is 1.

20 19. The composition of claim 18 wherein R^1 is hydroxyalkyl.

20. The composition of claim 1 wherein wherein a is 1, m and n are 0, X is oxygen, R^3 and R^7 join with X to form a heterocyclic moiety, and R^1 is alkoxy-hydroxyalkyl.

25 21. The composition of claim 20 wherein R^1 is isopropoxy-hydroxyethyl.

30 22. The composition of claim 1 wherein m is 0, X is alkoxyphenyl, and R^7 is hydroxyl.

23. The composition of claim 22 wherein R^1 is hydroxyalkyl.

35 24. The composition of claim 1 wherein X is oxygen, m is 0, n is 1, R^5 is aryloxyalkyl, and R^7 is hydrogen.

25. The composition of claim 1 wherein X is oxygen, m is 0, n is

1, R⁵ is alkoxyalkyl, and R⁷ is hydrogen.

26. The composition of claim 1 wherein R¹ is [mercaptoalkyl or] mercaptoalkoxycarbonylalkyl.

27. The composition of claim 1 wherein X is phenoxy, m is 0, and n is 1.

28. The composition of claim 27 wherein R¹ is hydroxyalkyl.

29. The composition of claim 1 wherein X is benzyl, R⁷ is hydroxyl, and m and n are 0.

30. The composition of claim 29 wherein R¹ is hydroxyalkyl.

31. The composition of claim 1 wherein the polymeric composition comprises a halogen-containing polymer.

32. The composition of claim 31 characterized further by the presence of a metallic-based heat stabilizer.

33. The composition of claim 32 wherein at least one of the metallic-based heat stabilizers is selected from the group consisting of antimony-, barium-, magnesium-, and calcium-, tin-, and zinc-based stabilizers.

34. The composition of claim 32 wherein the metallic-based heat stabilizer is an organometal compound.

35. The composition of claim 34 wherein the metallic-based heat stabilizer is an organotin compound.

36. The composition of claim 35 wherein the organotin compound is an organotin mercaptide.

37. The composition of claim 36 wherein the mercaptide moiety is an alkyl thioglycolate.

38. The composition of claim 36 wherein the mercaptide moiety is a mercaptoalkyl carboxylate.

39. The composition of claim 34 wherein the metallic-based heat stabilizer is an organometal mercaptoester sulfide.

40. The composition of claim 39 wherein the mercaptide moiety of the organometal mercaptoester sulfide is an alkyl thioglycolate.

41. The composition of claim 39 wherein the mercaptide moiety of the organometal mercaptoester sulfide is a mercaptoalkyl carboxylate.

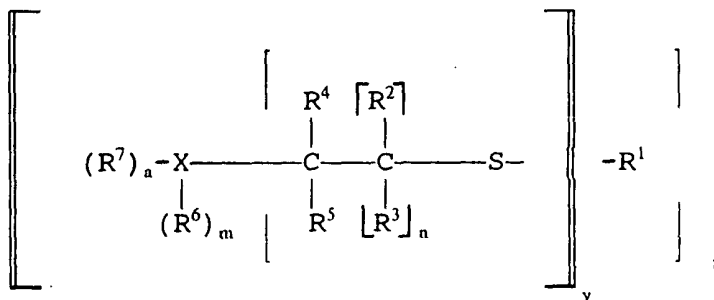
42. The composition of claim 39 wherein the organometal is an organotin.

43. The composition of claim 31 wherein the halogen-containing polymer is a vinyl chloride polymer.

44. The composition of claim 31 wherein a is 1, m and n are 0, y and z are 1, X is hydroxyphenyl, R⁴ is hydrogen, R⁵ is hydrogen or alkyl, R⁷ is alkoxy, and R¹ is hydroxyalkyl.

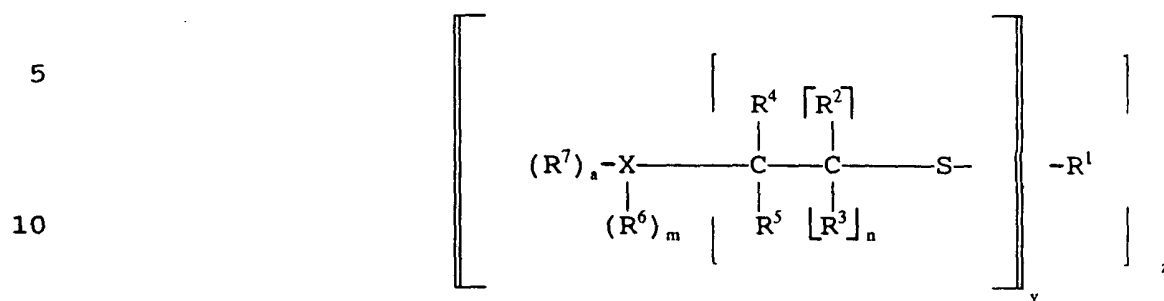
45. The composition of claim 31 wherein a is 1, m is 1, n is 0, y and z are 1, X is hydroxyphenyl, R⁴ and R⁵ are hydrogen, R⁶ is alkenyl, R⁷ is alkoxy, and R¹ is hydroxyalkyl.

46. The polymeric composition of claim 1 wherein said blocked mercaptan has the structure:



wherein a is 0 or 1, m and n are 0 or 1; y = 1 to 4, when y = 1, z is 1 to 4 when y is more than 1 z is 1; R¹ is a hydroxyalkyl, dihydroxyalkyl, hydroxy(polyalkoxy)alkyl, alkoxyalkyl, hydroxyalkoxyalkyl, alkoxy(hydroxyalkyl), alkoxy(acyloxyalkyl), alkoxy(polyalkoxy)alkyl, carboxyalkyl, acyloxyalkyl, acyloxy(hydroxyalkyl), acyloxyalkoxyalkyl, acyloxy(polyalkoxy)alkyl, benzoyloxy(polyalkoxy)alkyl, alkylenebis-(acyloxyalkyl), alkoxycarbonylalkyl, alkoxycarbonylalkylenyl, hydroxyalkoxycarbonylalkyl, hydroxy(polyalkoxy)carbonylalkyl, alkoxy(polyalkoxy)carbonylalkyl, mercaptoalkyl, mercaptoalkylenyl, mercaptoalkoxycarbonylalkyl, mercaptoalkoxycarbonylalkylenyl, alkoxycarbonyl(amido)alkyl, alkylcarbonyloxy(polyalkoxy)carbonylalkyl, tetrahydropyranyloxy(polyalkoxy)carbonylalkyl, tetrahydropyranyloxyalkyl, hydroxyaryl, mercaptoaryl or carboxyaryl radical having from 1 to 22 carbon atoms; R², R³, R⁴, R⁵, R⁶, and R⁷ are independently hydrogen, a hydroxyl, mercapto, alkyl, alkylene, aryl, haloaryl, alkaryl, aralkyl, hydroxyalkyl, mercaptoalkyl, mercaptoalkylene, hydroxyaryl, alkoxyaryl, alkoxyhydroxyaryl, arylcarbonyl, or mercaptoaryl radical having from 1 to 22 carbon atoms; when a = 1, X is arylcycloalkyl or a heteroatom, and when a = 0, X is aryl, haloaryl, alkaryl, alkoxyaryl, arylcycloalkyl, or a heteroatom, with the option that when a is 1 and m is 0, one of the R³ and R⁵ radicals joins with R⁷ and X to form a heterocyclic moiety with X as a heteroatom selected from the group consisting of oxygen and sulfur, and with the further option that when a is 1 and m is 1, R⁶ and R⁷ form a heterocyclic moiety in conjunction with X as a nitrogen atom.

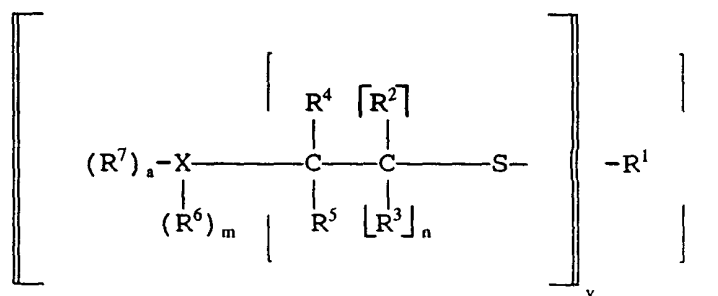
47. A blocked mercaptan having the structure:



wherein a is 0 or 1, m and n are 0 or 1; y = 1 to 4, when y = 1, z is 1 to 4 when y is more than 1 z is 1; R¹ is a hydroxyalkyl, dihydroxyalkyl, hydroxy(polyalkoxy)alkyl, alkoxyalkyl, hydroxyalkoxyalkyl, alkoxy(hydroxyalkyl), alkoxy(acyloxyalkyl), alkoxy(polyalkoxy)alkyl, carboxyalkyl, acyloxyalkyl, acyloxy(hydroxyalkyl), acyloxyalkoxyalkyl, acyloxy(polyalkoxy)alkyl, benzoyloxy(polyalkoxy)alkyl, alkylenebis-(acyloxyalkyl), alkoxycarbonylalkyl, alkoxycarbonylalkylenyl, hydroxyalkoxycarbonylalkyl, hydroxy(polyalkoxy)carbonylalkyl, alkoxy(polyalkoxy)carbonylalkyl, mercaptoalkyl, mercaptoalkylenyl, mercaptoalkoxycarbonylalkyl, mercaptoalkoxycarbonylalkylenyl, alkoxycarbonyl(amido)alkyl, alkylcarbonyloxy(polyalkoxy)carbonylalkyl, tetrahydropyranyloxy(polyalkoxy)carbonylalkyl, tetrahydropyranyloxyalkyl, hydroxyaryl, mercaptoaryl or carboxyaryl radical having from 1 to 22 carbon atoms; R², R³, R⁴, R⁵, R⁶, and R⁷ are independently hydrogen, a hydroxyl, mercapto, alkyl, alkylene, aryl, haloaryl, alkaryl, aralkyl, hydroxyalkyl, mercaptoalkyl, hydroxyaryl, alkoxyaryl, alkoxyhydroxyaryl, arylcarbonyl, or mercaptoaryl radical having from 1 to 22 carbon atoms; when a = 1, X is arylcycloalkyl or a heteroatom, and when a = 0, X is aryl, haloaryl, alkaryl, hydroxyaryl, dihydroxyaryl, alkoxyaryl, arylcycloalkyl, or a heteroatom; with the option that when a is 1 and m is 0, R⁵ joins with R⁷ and X to form a heterocyclic moiety with X as a heteroatom selected from the group consisting of oxygen and sulfur, and with the further

option that when a is 1 and m is 1, R⁶ and R⁷ form a heterocyclic moiety in conjunction with X as a nitrogen atom.

48. A composition for stabilizing PVC consisting essentially of a metallic-based stabilizer for PVC and a latent mercaptan having the formula



wherein a is 0 or 1, m and n are 0 or 1; y = 1 to 4, when y = 1, z is 1 to 4 when y is more than 1 z is 1; R¹ is a hydroxyalkyl, dihydroxyalkyl, hydroxy(polyalkoxy)alkyl, alkoxyalkyl, hydroxyalkoxyalkyl, alkoxy(hydroxyalkyl), alkoxy(acyloxyalkyl), alkoxy(polyalkoxy)alkyl, carboxyalkyl, acyloxyalkyl, acyloxy(hydroxyalkyl), acyloxyalkoxyalkyl, acyloxy(polyalkoxy)alkyl, benzoyloxy(polyalkoxy)alkyl, alkylenebis-(acyloxyalkyl), alkoxycarbonylalkyl, alkoxycarbonylalkylenyl, hydroxyalkoxycarbonylalkyl, hydroxy(polyalkoxy)carbonylalkyl, alkoxy(polyalkoxy)carbonylalkyl, mercaptoalkyl, mercaptoalkylenyl, mercaptoalkoxycarbonylalkyl, mercaptoalkoxycarbonylalkylenyl, alkoxycarbonyl(amido)alkyl, alkylcarbonyloxy(polyalkoxy)carbonylalkyl, tetrahydropyranyloxy(polyalkoxy)carbonylalkyl, tetrahydropyranyloxyalkyl, hydroxyaryl, mercaptoaryl or carboxyaryl radical having from 1 to 22 carbon atoms; R², R³, R⁴, R⁵, R⁶, and R⁷ are independently hydrogen, a hydroxyl, mercapto, alkyl, alkylenyl, aryl, haloaryl, alkaryl, aralkyl, hydroxyalkyl, mercaptoalkyl, hydroxyaryl, alkoxyaryl, alkoxyhydroxyaryl, arylcarbonyl, or mercaptoaryl radical having from 1 to 22 carbon atoms; X is aryl, haloaryl, alkaryl, hydroxyaryl, dihydroxyaryl,

aralkaryl, alkoxyaryl, arylcycloalkyl, or a heteroatom, with the option that when a is 1 and m is 0, one of the R³ and R⁵ groups joins with R⁷ and X to form a heterocyclic moiety with X as a heteroatom selected from the group consisting of oxygen, and sulfur, and with the further option that when m is 1, R⁶ and R⁷ may form a heterocyclic moiety in conjunction with X as a nitrogen atom; with the proviso that when X is aralkaryl, R⁶ and R⁷ are hydroxyl, a is 1 and m is 1, then z is 1 or 2; and with the further proviso that when R⁶ ≠ hydroxyl or mercapto, z is 1.

49. The composition of claim 48 further characterized by the presence of a biocide.

50. The composition of claim 49 wherein the biocide is 10, 10'-oxybisphenoxarsine.

51. The composition of claim 1 characterized further by the presence of an antioxidant which is a blocked mercaptan having the structure of Formula 1 wherein a is 1, m and n are 0, y and z are 1, X is phenyl, R⁴ and R⁵ are hydrogen, R⁷ is hydroxy, and R¹ is hydroxyethyl.

52. The composition of claim 1 characterized further by the presence of an antioxidant which is a blocked mercaptan having the structure of Formula 1 wherein a is 1, m and n are 0, y is 1, z is 2, X is phenyl, R⁴ is hydrogen, R⁵ is ethyl, R⁷ is hydroxy, and R¹ is hydroxyethyl.

53. A composition capable of stabilizing a halogen-containing polymer against deterioration caused by heat, said composition comprising the blocked mercaptan of claim 45 as the sole heat stabilizer,

54. The composition of claim 53 wherein a is 1, m is 0, n is 0, y is 1, z is 1, X is O, R⁵ and R⁷ are joined with X to form a heterocyclic moiety, R⁴ is hydrogen, and R¹ is hydroxyalkyl.

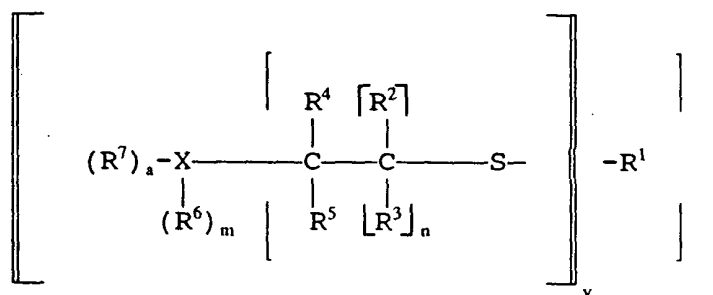
55. The composition of claim 53 wherein a is 1, m and n are 0, y and z are 1, X is phenyl, R⁷ is o-hydroxy, R⁴ is hydrogen, R⁵ is alkyl, and R¹ is hydroxyalkyl.

56. The composition of claim 31 characterized further by the presence of from 0.01 to 10% of a phenolic antioxidant by weight of the halogen-containing resin.

57. The composition of claim 56 wherein the amount of antioxidant is from 0.1-5% of the halogen-containing resin.

58. The composition of claim 56 wherein R¹ is hydroxyethyl.

59. A polymeric composition comprising a photostabilizer to retard discoloration caused by ultra-violet radiation, said photostabilizer having the general formula:



wherein a is 1, m and n are 0; y and z = 1, X is o, p, -dihydroxyphenyl, R¹ is hydroxyalkyl, R⁴ is hydrogen, R⁵ is alkyl, and R⁷ is a m-phenylcarbonyl radical.

60. A method for the preparation of a heat stabilizer for halogen-containing polymers, said method comprising condensing a *para*-substituted phenol with formaldehyde in the presence of an alkali metal hydroxide in aqueous solution at a temperature of up to about 60°C, wherein the ratio of the phenol to formaldehyde is from 1:1 to about 1:1.05 on an equivalent weight basis, and the molar ratio of the phenol to alkali metal hydroxide is about 1:1, quenching the condensation by cooling the reaction mixture below 20°C, neutralizing the mixture, isolating

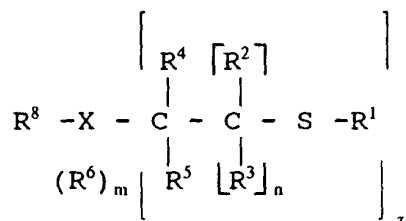
the resultant condensate, and further condensing the resultant condensate without further purification with a mercaptan-containing compound selected from the group consisting of alkyl mercaptans, mercapto esters, mercapto alcohols, and mercapto acids at from about 40° to about 120°C in the presence of an acid catalyst.

61. The method of claim 60 wherein the maximum temperature during the phenol/formaldehyde condensation is about 50°C.

62. The method of claim 61 wherein the temperature is from about 35° to about 50 °C.

63. The method of claim 60 wherein the total concentration of phenolic and formaldehyde reactants is from about 25 to about 50 % by weight.

64. A compound having the formula AB_z wherein wherein A is Sn, Ba, Ca, Al, Mg, monoalkyltin, dialkyltin, or trialkyl tin, B has the formula:



m and n are 0 or 1, X is aryl, alkaryl, or haloaryl, R₁ is an alkyl, alkylenyl, cycloalkyl, cycloalkylenyl, aryl, alkaryl, aralkyl, aralkylenyl, hydroxyalkyl, dihydroxyalkyl, hydroxy(polyalkoxy)alkyl, alkoxyalkyl, hydroxyalkoxyalkyl, alkoxy(hydroxyalkyl), alkoxy(acyloxyalkyl), alkoxy(polyalkoxy)alkyl, carboxyalkyl, acyloxyalkyl, acyloxy(hydroxyalkyl), acyloxyalkoxyalkyl, acyloxy(polyalkoxy)alkyl, benzoyloxy(polyalkoxy)alkyl, alkylenebis-(acyloxyalkyl), alkoxycarbonylalkyl, alkoxycarbonylalkylenyl, hydroxyalkoxycarbonylalkyl, hydroxy(polyalkoxy)carbonylalkyl, alkoxy(polyalkoxy)carbonylalkyl, mercaptoalkyl,

mercaptoalkylenyl, mercaptoalkoxycarbonylalkyl,
mercaptoalkoxycarbonylalkylenyl, alkoxycarbonyl(amido)alkyl,
alkylcarbonyloxy(polyalkoxy)carbonylalkyl,
tetrahydropyranyloxy(polyalkoxy)carbonylalkyl,
5 tetrahydropyranyloxyalkyl, hydroxyaryl, mercaptoaryl or
carboxyaryl radical having from 1 to 22 carbon atoms; R², R³, R⁴,
R⁵, and R⁶ are, independently, hydrogen, a hydroxyl, mercapto,
acyl, alkyl, alkylenyl, aryl, haloaryl, alkaryl, aralkyl,
hydroxyalkyl, mercaptoalkyl, hydroxyaryl, alkoxyaryl,
10 alkoxyhydroxyaryl, or mercaptoaryl radicals having from 1 to 22
carbon atoms; R⁸ is O⁻ or S⁻, z is 1 or 2, and b is from 1 to 4.

65. The compound of claim 64 wherein A is dibutyltin, m and n
are 0, z is 1, X is phenyl, R⁴ and R⁵ are hydrogen, R⁸ is O⁻, R¹
15 is hydroxyethyl, and b is 2.

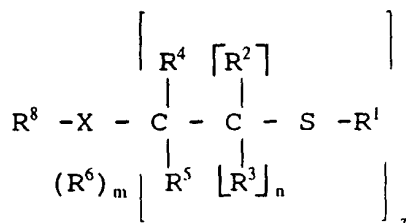
66. A polymeric composition comprising the compound of claim 65
as a heat stabilizer.

67. The composition of claim 66 wherein the polymer is a
20 halogen-containing polymer.

68. A compound having the formula



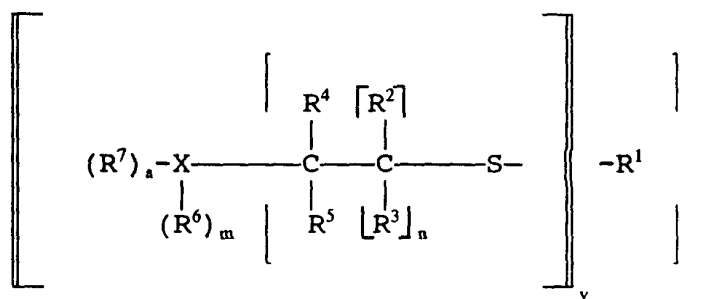
25 wherein P is phosphorus, Q is an alkoxy, aryloxy, aralkoxy,
alkaryloxy, or haloaryloxy radical, p is 1 or 2 and B is



30 wherein n is 0 or 1; z is 1 or 2; X is aryl, haloaryl, or
arylcycloalkyl, R¹ is an alkyl, alkylenyl, cycloalkyl,
35 cycloalkylenyl, aryl, alkaryl, aralkyl, aralkylenyl,

hydroxyalkyl, dihydroxyalkyl, hydroxy(polyalkoxy)alkyl,
alkoxyalkyl, hydroxyalkoxyalkyl, alkoxy(hydroxyalkyl),
alkoxy(acyloxyalkyl), alkoxy(polyalkoxy)alkyl, carboxyalkyl,
acyloxyalkyl, acyloxy(hydroxyalkyl), acyloxyalkoxyalkyl,
acyloxy(polyalkoxy)alkyl, benzoyloxy(polyalkoxy)alkyl,
alkylenebis-(acyloxyalkyl), alkoxycarbonylalkyl,
alkoxycarbonylalkylenyl, hydroxyalkoxycarbonylalkyl,
hydroxy(polyalkoxy)carbonylalkyl,
alkoxy(polyalkoxy)carbonylalkyl, mercaptoalkyl,
mercaptoalkylenyl, mercaptoalkoxycarbonylalkyl,
mercaptoalkoxycarbonylalkylenyl, alkoxycarbonyl(amido)alkyl,
alkylcarbonyloxy(polyalkoxy)carbonylalkyl,
tetrahydropyranyloxy(polyalkoxy)carbonylalkyl,
tetrahydropyranyloxyalkyl, hydroxyaryl, mercaptoaryl or
carboxyaryl radical having from 1 to 22 carbon atoms; R², R³, R⁴,
R⁵, and R⁶ are independently hydrogen, a hydroxyl, mercapto,
acyl, alkyl, alkylenyl, aryl, haloaryl, alkaryl, aralkyl,
hydroxyalkyl, mercaptoalkyl, hydroxyaryl, alkoxyaryl,
alkoxyhydroxyaryl, mercaptoaryl groups having from 1 to 22 carbon
atoms; and R⁸ is O⁻.

69. A polymeric composition comprising a halogen-containing
polymer, a primary mercaptan-containing heat stabilizer, and
odor-masking latent mercaptan having the structure



wherein a is 1, m and n are 0; y is 1; z is 1; R¹ is
hydroxyalkyl, R⁴ and R⁵ are independently hydrogen or alkyl, R⁷
is selected from the group consisting of hydroxy, alkoxy, and
alkenyl; and X is hydroxyaryl or alkoxyaryl.

70. The composition of claim 69 wherein the concentration of the latent mercaptan is from about 0.01 to about 0.1 part per hundred parts of the halogen-containing polymer.

5 71. A chelating agent having the structure of Formula 1 wherein a is 2, m is 1, n is 0, y is 2, X is phenyl, R¹ is ethyloxyethyl, R⁶ is hydroxyl, and R⁷ is methyl.

10 72. A chelating agent having the structure of Formula 1 wherein a is 1, m and n are 0, y is 1, X is oxygen, R⁵ and R⁷ join with X to form a heterocyclic moiety, and R¹ is a hydroxy(polyethoxy)carbonylalkyl radical.